WEED MANAGEMENT
NATURAL RESOURCES DIVISION

EAST FORK LEWIS RIVER, NORTH FORK LEWIS RIVER, CEDAR CREEK, PUP CREEK, LITTLE WASHOUGAL RIVER, WASHOUGAL RIVER

CLARK COUNTY WEED MANAGEMENT
NATURAL RESOURCES DIVISION

KNOTWEED CONTROL PROJECT
2007 REPORT

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This report provides a review of the work accomplished during the 2007 treatment season, with comparison to 2004, 2005, and 2006 seasibs. Recommendations and goals for the future are included.

The attached spreadsheets provide detailed data for all infestations. Also included is information concerning continued re-growth of mutated plants and the treatment methods that may be successful in controlling their return, including field-testing site results using various herbicide and surfactant combinations, along with cut and fill methods for small diameter plants.

The start date for the 2007 project was May 1st, beginning with an evaluation survey of the previously treated sites along the Lewis River.

PROJECT GOAL FOR 2007

The primary goal was to survey the main stem and tributaries of all river and creek systems previously treated in 2004, 2005, and 2006, and re-treat all re-growth sites. Search for and treat any knotweed infestation not previously discovered during prior year surveys. The waterways included in this year's project were East Fork Lewis River (fourth season treatment); North Fork Lewis River, Cedar Creek, Pup Creek, and Speelyai Creek (third season treatments); Little Washougal River (first year treatment); main stem of the Washougal River (first year treatment).

TREATMENT STUDIES FOR MUTATED RE-GROWTH

During the 2007 season, it became apparent that the standard methodology of foliar spraying re-growth sites was not getting the results expected. As treatment had to be repeated, this method was more like chemical mowing than eradication. The spraying of the mutated plants seems to actually stimulate continued re-growth. The treated plants would die off, however, there would be more stems to replace them at various points along the rhizomes. The results indicate that removing the original canes at a site is not the main issue; the real battle is with the mutated re-growth.

Realizing that foliar spray was not having the desired effect, there needs to be another approach to the method of application. In an effort to find a method that would have reliable effects, there were test sites set up to research a cut stem and fill application. Small stalks in the test plots were cut and filled with Aqua-Master (100%), or a mixture of Aqua-Master and surfactant. The short-term results were mixed.

Along with the test sites, further investigation of long-term chemical effects on root mass is being conducted by Dr. Ron Crockett. Root specimens were collected from various sites then were cut open and tested for retention of carbohydrates. Results from these test plots and root testing will not be available until the 2008 report.

PAID LABOR

One project coordinator and two field laborers were paid for work performed in 2007. Field personnel were employed for a four and a half month period.

DESCRIPTION OF PROJECT AREAS

The East Fork Lewis River

Main stem totals 32.5 miles from Sunset Campground down to its confluence with the North Fork Lewis River, Woodland, Washington. This river course is subject to heavy flooding during the winter.

Cedar Creek

This is the main tributary of the North Fork Lewis. This 20-mile creek is fed by a series of smaller tributaries accounting for 60 miles of waterways. Of these larger tributaries, stats for Pup Creek (5 miles) are indexed and included in this report.

North Fork Lewis River

Main stem totals 21 miles from Merwin Dam to the Columbia River. The river is an important habitat for salmon, steelhead, and supports a variety of wildlife. There are two Washington State fish hatcheries located on the river. This river course is subject to flooding during the winter, but the dam does regulate the flow rom the mainstream headwaters.

Yale Lake and Merwin Lake

Yale and Merwin lakes are man made reservoirs created by the building of Merwin Dam. Both lakes were surveyed in 2005 by circumnavigating each lake. There were no Japanese Knotweed sites found on Merwin Lake and only one site on Yale Lake. In 2007 there was one additional site found on Yale Lake that grew from a debris pile. Both sites were located at Cougar Park, Cowlitz County. Pacific Power and Electric maintain Lake Merwin and Yale Lake.

Washougal River

Main stem totals 33 miles, 12 of which flow through Clark County then ultimately into the Columbia River at Camas. The headwaters of the Washougal River begin in the Gifford Pinchot National Forest in Skamania County. The entire drainage area of the river basin is 212 square miles, 50 square miles of which are in Clark County. The two major tributaries are the Little Washougal River and Cougar Creek. The last four miles of the river flow through the cities of Camas and Washougal. The Washougal River and its tributaries are an important local and regional resource for boating, fishing, and swimming. Two of the tributaries, Boulder Creek and Jones Creek are a source of municipal drinking water for the City of Camas, WA. The Washougal River provides habitat for various wildlife including Chinook, Chum, summer and Winter Steelhead, Coho Salmon, and Coastal Cutthroat Trout. The water quality is rated from “good to excellent.” (A game plan was developed with the City of Camas Water Department, prior to the survey and treatment of Boulder and Jones Creek.)

Little Washougal River

Main stem totals 10 miles, all of which are within Clark County. Drainage area is 24.5 square miles. The Little Washougal drains the upper and lower Little Washougal sub watersheds including Boulder Creek, Jones Creek, and the East Fork of the Little Washougal which extends into Skamania County.

SURVEY AND RE-TREATMENT

East Fork Lewis River Survey and Re-treatment (Fourth Season Treatment)

- **Start date: May 16, 2007**
  - All sites along the 32 miles of the East Fork were visited and accessed either by driving to the site, hiking into the site or using a raft and kayaks to transport team members and equipment. The focus in 2007 was two fold. One, the treatment of sites from years 2004, 2005 and 2006. Two, to seek out and treat any undiscovered sites not previously located. In the winter of 2006, this waterway was subject to the heavy flooding since 1996, water flooding far beyond its banks and has changed the river's course at some junctions. After finding several sites beyond the rivers previous banks we have had to expand search areas to include areas flooded.

    These areas included:
  - Sunset Falls.
  - Sunset Falls Rd. and Lucia Falls Rd.
  - Sites below Moulten Falls along Lucia Falls Rd. to Lucia Falls.
  - Sites below Lucia Falls along Lucia Falls Rd. to Heisson Bridge.
  - Cole Witter Rd. and surrounding sites.
  - Lewisville Park
  - Daybreak Park
  - Storedahl (including newly found sites)
  - Swanson's Property
  - Roadside sites
- **End of Season: October 15, 2007**

Cedar Creek (Third Season Treatment)

- **Start date: May 31, 2007**
  - Starting at Amboy Bridge, upstream to headwaters, access was done by driving to various points along the creek and hiking up stream or downstream as needed to complete surveys (11 miles).
  - Starting at Amboy Bridge, downstream to above Grist Mill (8 miles), it is necessary to drag kayaks to transport herbicide and equipment. During the summer months the creek does not have enough water to support a craft of any size for any long distances.
  - From the Grist Mill to the Mouth of Cedar Creek, dragging kayaks to transport herbicide and equipment (3 miles).
- **End of Season: July 24, 2007**

Pup Creek (5 miles) (Third Season Treatment)

- **Start date: May 24, 2007**
  - Pup Creek was accessed by Cedar Creek Rd., and hiked downstream to complete survey and treatment using kayaks to transport needed equipment.
- **End of Season: October 11, 2007**

North Fork Lewis River (Third Season Treatment)

- **Start date:** **August 1, 2007**
  - The North Fork is a waterway different in characteristics from the East Fork and the tributaries. Much of its length is wide and slow moving. Merwin dam regulates water flow. Dikes shape the banks around Woodland, and reed canary grass becomes dominant. Access was accomplished by raft. There were limited sites available by land access.
  - Both Clark County and Cowlitz County sides of the river were surveyed and treated.
- **End of Season:** **October 11, 2007**

Eagle Island (Third Season Treatment)

- Re-growth from sites treated in 2006 was minimal, requiring only one visit to re-treat.

Yale Lake (Third Season Treatment)

- **Start date:** **May 24, 2007**
  - Site discovered in 2005 project was visited and treated as needed, in Cougar Park at the mouth of Cougar Creek. A second site was discovered away from the lake, forming around a debris pile of dirt and cuttings from around the park.
- **End of Season:** **July 16, 2007**

Little Washougal River (First Season Treatment)

- **Start date:** **July 10,2007**
  - The Little Washougal River is the main tributary of the Washougal River.
  - 10 surveyed miles.
  - 5 treated miles (13.3 acres of treated area)
  - Survey and treatment was accomplished by walking the length of the river using kayaks to transport equipment.
- **End of Season:** **September 26, 2007**

Washougal River (First Season Treatment)

- **Start date:** **June 1,2007**
  - The Washougal River is the main watercourse in the Washougal basin.
  - The Washougal River is a waterway with different characteristics from the Little Washougal as well as all the previously surveyed watercourses. The riverbed is a challenge to ford, as it is mostly large rocks and deep sink holes. This makes treatment a much slower process. On other waterways, 1/2 mile a day is the usual treated distance that can be accomplished. However, due to the characteristics of the Washougal the same distance takes upwards of three to four days. The high number of canes to be treated also attributes to the difference in treatment time needed.
  - 10 Surveyed miles.
  - 1 1/2 treated miles (36 acres of treated area)
  - Survey and treatment was accomplished by walking the length of the river using kayaks to transport equipment.
- **End of Season:** **October 2, 2007**

Washougal Roadside Sites (First Season Treatment)

- **Project start date:** **June 21, 2007**
  - There were only four roadside sites found this year that threaten the riparian area.
  - The largest of these sites was a roadside Giant knotweed infestation. The canes ranged from six to twelve feet in height.
  - We were able to drive up to each location.
- **End of Season** **September 26, 2007**

SURVEY SUMMARY

- 96.5 miles of river, creek, and tributaries were surveyed.
- Of this, 46.5 total miles were treated for Japanese knotweed infestations.

Notes on Surveys

1. It cannot be assumed that 100% of all knotweed infestations on the tributaries were found, even with this reasonable, systematic method. Surveying the entire length of all tributaries, including their seasonal drainages, requires much more time and complete landowner cooperation.
2. It also cannot be assumed that 100% of all knotweed infestations were found within the 96.5 main stem and tributary survey miles, due to the likelihood of human error. There is the possibility some small knotweed patches simply were not visually spotted. This is very evident on the East Fork due to the wide spread of water during the flood of 1996 and 2006. The flooding relocated plant remnants throughout the river corridor. Many of these areas had not been flooded since 1996, so it was not expected to find infestations so far from the prominent river course.

JK Team on the East Fork Lewis River

JK Team on Cedar Creek

TREATMENT AND CONTROL STATISTICS

Knotweed Statistics (2004) East Fork Lewis

- 247 infestations were recorded on 77 properties
- Of the 77 properties controlled, 18 are Clark County properties. The other 59 are private.
- Of the 59 private properties, 43 were treated primarily by injection.
- 229 of the 247 infestations are on the main stem.

Knotweed Statistics (2005) East Fork Lewis and North Fork Lewis

- 291 infestations were recorded on 150 properties.
- 28 properties owned by Clark County, 6 State of Washington, 18 Pacific Power and Electric, and 98 Private Property owners.
- 262 of the 291 infestations are located on the waterways.
- Combining the knotweed infestations totals 500 acres.
- Regular flooding influences 187 of the 291 infestations.

Knotweed Statistics (2006) East Fork Lewis and North Fork Lewis

- 204 infestations were recorded on 116 properties.
- 28 properties owned by Clark County, 6 State of Washington, 18 Pacific Power and Electric, and 64 Private Property owners.
- 88 of the 204 infestations are located on the waterways, showing good control, pushing the infestation away from the flood zone.
- Combining the knotweed infestations totals 87 acres.
- Regular flooding influences 116 of the 204 infestations.

Knotweed Statistics (2007) East Fork Lewis, North Fork Lewis and Washougal River

- 246 infestations were recorded on 153 properties.
- 35 properties owned by Clark County, 8 State of Washington, 18 Pacific Power and Electric, and 74 Private Property owners.
- 213 of the 246 infestations are located on the waterways.
- Combining all knotweed infestations totals treated 130 acres.
- Regular flooding influences 213 of the 246 infestations.
- 130 total acres, and 128,571 canes were treated.

As the 2007 season is the fourth year of treatment, it was expected that less river miles, acres, and total canes would be treated. This proved to be correct as the number of canes re-treated in 2006 was 178,071 and in comparison the number of canes again re-treated in 2007 at the same sites was 27,375. **From 2006 to 2007 there was a decrease of 150,696 canes.**

Data Gathering:

The collected Data includes needed information for WSDA Herbicide Application Form. Information recorded while in the field is:

- Date and times of treatment
- Acres of site
- Cane count
- Method of treatment
- Description of site (soil type, vegetation type)
- GPS location
- Wind speed and temperature
- Plant density
- Plant height

TREATMENT METHODS

Injection is the preferred method of treatment for the control of knotweed. Foliar spray is used when knotweed stems are too small to inject. To address the problematic, and often ineffective, spraying of small stems, a cut and inject (cut and fill) study has begun.

As most sites are in a state of re-growth from previous years treatments, foliar treatment was to be used often. Stems were often small in size (diameter) or grew into a vine like plant, as stalk was too thin to support leaf weight. However, newly discovered sites as well as beginning the Washougal corridor supplied ample numbers of large cane to inject, accounting for 30,000 canes injected in 2007 project.

East Fork Lewis:

This waterway was subject to heavy flooding in 2006, water flooding far beyond normal, and at some locations the river's course was changed. After finding several sites beyond the original search area, we have had to expand our surveys to include flooded regions of 1996 and 2006.

Return growth at sites treated in 2004, 2005 and 2006 were found to be stunted or mutated. When this occurred, foliar spray was the primary method of treatment.

One new site found in 2006 (Storedahl Property) was too late in the season to treat when found. Treatment of this site began in 2007 accounting for 13,852 treated canes.

First application of the retreated sites along the river began on May 16th. Re-treatment portions of the East Fork and treatment of newly discovered sites within the East Fork corridor were completed by October 15th. New sites along the East Fork accounted for 27,000 canes that were not previously treated; of these 10,000 canes were located at one site.

Jenny Creek:

The method of treatment was application by foliar spray, as the re-growth was smaller in size then first year treatment. There were 1069 canes treated in 2006, compared to 600 canes treated by foliar spray in 2007.

Cedar Creek:

As the project progressed into the North Fork river basin, Cedar Creek was found to have canes of smaller diameter, therefore foliar spray was used. As this is the third season for treatment, cane diameter size was affected by previous year's treatment. The Cedar Creek ravine is deep and

shaded by surrounding trees with high stream banks therefore there is a sufficient difference in available light for growth. In 2005 there were 51,000 canes treated compared to 2600 canes treated in 2007.

Pup Creek:

This waterway was affected by 2005 treatment not managed by Clark County. A property owner took the time to treat Pup Creek on his own. The method used was cut stump. As to the herbicide used, this is unknown. The 2005 team followed later and treated any re-growth. In 2006 it was found that most cut stump treated canes returned. Pup creek was significantly affected by the 2006 treatment. There were 15,383 canes treated in 2006 compared to 2,964 canes treated in 2007.

North Fork Lewis River:

This river course is vastly different in character than all of the other project waterways. The North Fork Lewis is a large river, controlled by water released from Merwin Dam. The riverbanks and cliff sides extend several hundred feet high in some places, creating a significant difference in available light. In addition, the top ridges and banks are heavily forested with tall native Cedar and various species of conifer trees, combined with other foliage. Most often, the south side of the river is covered in shade until late afternoon. In 2007, re-treatment was often foliar spray as most sites are in their third year of control. Third season treatment in 2006 accounted for 67,000 canes treated, compared to 20,000 canes treated in 2007.

The Big "Kahuna":

In 2005 the cane count was 43,600, in 2006 re-growth accounted for 17,800 canes and in 2007 4600 canes were treated with foliar spray.

Speelyai Creek:

In 2005 there were 2,940 canes treated, in 2006 there were 264 canes to treat and in 2007 there were 156 canes treated using foliar spray.

Roadside Sites: (Clark County and Cowlitz County)

Roadside locations are situated along roadways away from river flood zones. These sites, though not an immediate threat to the river systems, were treated to remove any possible threat in the future to the nearby waterways. Sites were mostly private property. Treatment in 2005 accounted for 29,000 canes treated. In 2006 there were 22,000 canes treated, and in 2007 there were 3,500 canes treated.

Little Washougal River (First Season Treatment)

This river was the starting point for the Washougal River basin project. The Little Washougal River is the largest tributary into the main stem of the Washougal River. Treatment started by walking the river corridor and injecting all canes large enough and that were accessible. Again in September the treatment crew walked the river and at this time used foliar spray on any remaining canes not previously treated. There were 6,543 canes injected and 5,190 canes treated with foliar spray.

Washougal River (First Season Treatment)

The Washougal River is a waterway with different characteristics than any previously surveyed watercourse. The riverbed is also a challenge to ford, as it is mostly large rocks and deep sink holes. This makes treatment a much slower process. Treatment began just above the Clark Co. and Skamania Co. lines. Treatment team used kayaks and small rubber raft to transport equipment. A combination of injection and foliar spray was used. There were 18,000 canes injected and 19,000 canes treated with foliar spray.

Washougal Roadside Sites (First Season Treatment)

There were only four roadside sites found this year. The largest of these sites was a Giant knotweed infestation. The canes ranged from six to twelve feet in height. Treatment at this site was a combination of injection and foliar spray as sections of this site were not accessible due to cliff side incline. Another site was a roadside infestation of Himalayan Knotweed, bordering Cougar Creek. All sites were road side and easily accessible.

Treatment of Infestations by Method: 2004

Treatment Method	Number of Sites Treated	Number of Canes Treated
Injection only (Aqua-Master)	124	
Foliar spray (Aqua /Habitat /Agri-Dex) only	55	
Injection/ Foliar spray combination treat	68	
Total	247	124,200

Treatment of Infestations by Method: 2005

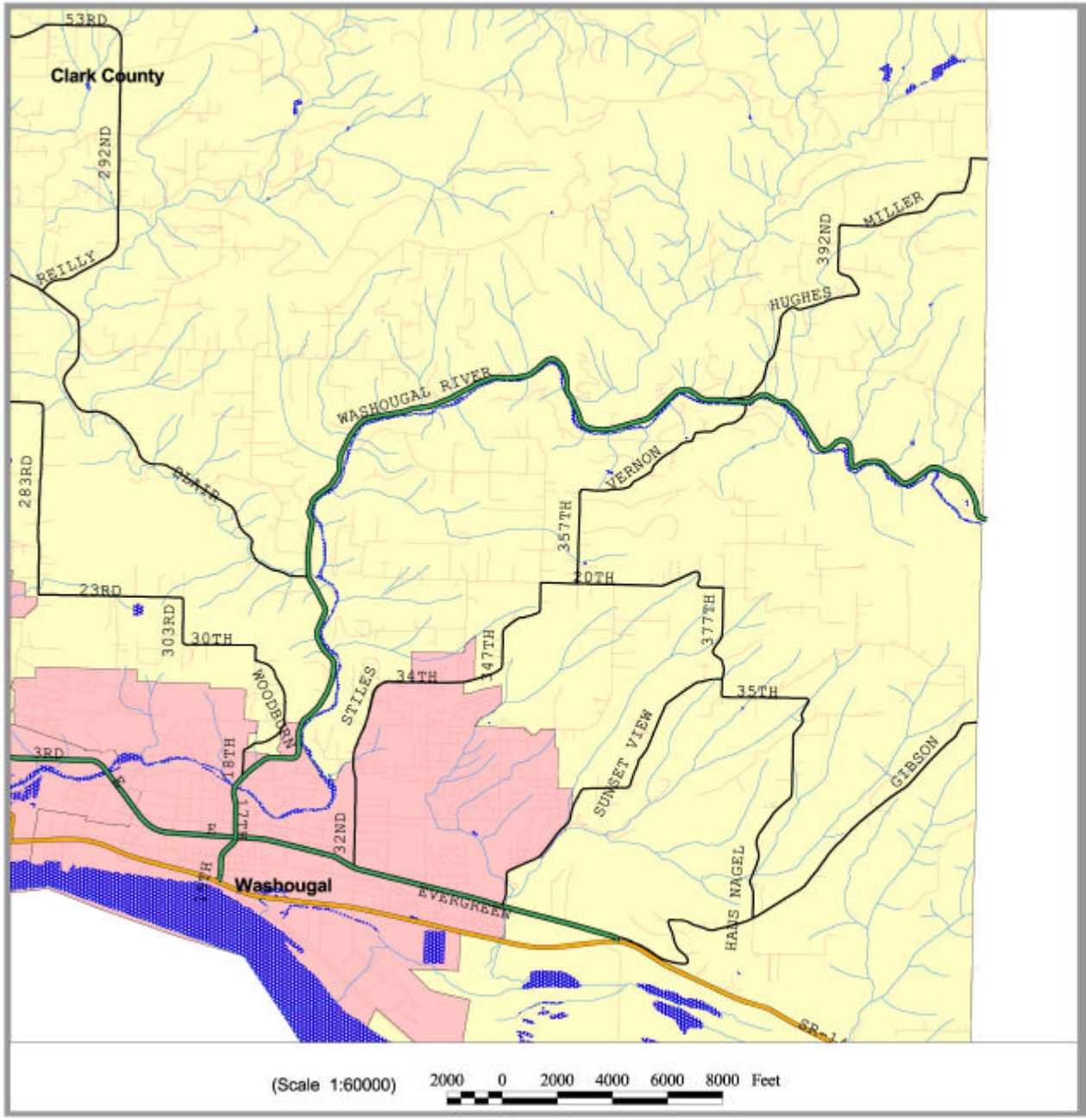
Treatment Method	Number of Sites Treated	Number of Canes Treated
Injection only (Aqua-Master)	47	23,570
Foliar spray (Aqua /Habitat /Agri-Dex) only	181	148,050
Injection/ Foliar spray combination treat	63	136,133
Total	291	307,753

Treatment of Infestations by Method: 2006

Treatment Method	Number of Sites Treated	Number of Canes Treated
Injection only (Aqua-Master)	16	2,799
Foliar spray (Aqua /Habitat /Agri-Dex) only	181	216,938
Injection/ Foliar spray combination treat:	41	31,538
Total	204	251,275

Treatment of Infestations by Method: 2007

Treatment Method	Number of Sites Treated	Number of Canes Treated
Injection only (Aqua-Master)	28	14,515
Foliar spray (Aqua /Habitat /Agri-Dex) only	174	72,186
Injection/ Foliar spray combination treat:	44	41,870
Total	246	128,571



2007 Knotweed Project

Washougal Watershed

SW 1/4 of Section 34 T2R4E WM

Major Roads
- State Route
- Interstate
- Primary Arterial
- Arterial
- State Route Ramp
- Interstate Ramp
- Streams & Rivers
- Roads
- Water Bodies

Municipal Jurisdiction
- Unincorporated
- Incorporated

Set Dept Name in Preferences

CLARK COUNTY
WASHINGTON

Plot Date: Nov 5, 2007
Map produced by: rs

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